WHAT IS CLAIMED IS:

1. A semiconductor device, comprising:

a gate electrode;

an insulating layer on the gate electrode;

a first electrode on the insulating layer;

a second electrode on the insulating layer at an interval with the first electrode;

an organic semiconductor layer disposed in the interval between the first electrode and the second electrode and covering at least part of the first electrode and the second electrode; and

a first resistance layer formed on the organic semiconductor layer and having an electrical resistance lower than an electrical resistance of the organic semiconductor layer.

2. The semiconductor device as claimed in

claim 1, wherein both a distance from the first electrode to the first resistance layer and a distance from the second electrode to the first resistance layer are shorter than the interval between the first electrode and the second electrode.

3. The semiconductor device as claimed in claim 1, wherein one of the first electrode and the second electrode is in contact with the first resistance layer.

4. The semiconductor device as claimed in claim 1, further comprising a second resistance layer formed at least at one of the position between the first resistance layer and the organic semiconductor layer, the position between the first electrode and the organic semiconductor layer, and the position between the second electrode and the organic semiconductor layer,

wherein the second resistance layer has an electrical resistance so that carriers in the organic semiconductor layer are allowed to tunnel through the second resistance layer when a voltage of a predetermined value or more than the predetermined value is applied across the second resistance layer.

5. The semiconductor device as claimed in claim 1, wherein

at least one of the first electrode, the second electrode and the first resistance layer is in contact with the organic semiconductor layer; and

an interface between one of the first electrode, the second electrode and the first resistance layer rectifies an electrical current therethrough.

6. The semiconductor device as claimed in claim 1, wherein the first resistance layer is formed

to be one of a plate shape, an inter-digital shape, a grating shape, and a disk shape.

7. The semiconductor device as claimed in claim 1, wherein a substrate is beneath the gate electrode.

8. A semiconductor device, comprising:

a first electrode;

a second electrode at an interval with the first electrode;

an organic semiconductor layer disposed in the interval between the first electrode and the second electrode and covering at least part of the first electrode and the second electrode;

a first resistance layer formed on the organic semiconductor layer and having an electrical resistance lower than an electrical resistance of the organic semiconductor layer;

an insulating layer on the first resistance layer; and

a gate electrode on the insulating layer.

9. The semiconductor device as claimed in claim 8, further comprising a second resistance layer formed at least at one of the position between the first resistance layer and the organic semiconductor layer, the position between the first electrode and the organic semiconductor layer, and the position between the second electrode and the organic semiconductor layer,

wherein the second resistance layer has an electrical resistance so that carriers in the organic semiconductor layer are allowed to tunnel through the second resistance layer when a voltage of a predetermined value or more than the predetermined value is applied across the second resistance layer.

10. The semiconductor device as claimed in claim 8, wherein a substrate is beneath the first electrode, the second electrode and the organic semiconductor layer.

11. A semiconductor device, comprising:

an organic semiconductor layer;

a first resistance layer beneath the organic semiconductor layer and having an electrical resistance lower than an electrical resistance of the organic semiconductor layer;

a first electrode on the organic semiconductor layer;

a second electrode on the organic semiconductor layer at an interval with the first electrode;

an insulating layer disposed in the interval between the first electrode and the second electrode and covering the first electrode and the second electrode; and

a gate electrode on the insulating layer,

wherein the first resistance layer has an

electrical resistance lower than that of the organic semiconductor layer.

12. The semiconductor device as claimed in claim 11, further comprising a second resistance layer formed at least at one of the position between the first resistance layer and the organic semiconductor layer, the position between the first electrode and the organic semiconductor layer, and the position between the second electrode and the organic semiconductor layer,

wherein the second resistance layer has an electrical resistance so that carriers in the organic semiconductor layer are allowed to tunnel through the second resistance layer when a voltage of a predetermined value or more than the predetermined value is applied across the second resistance layer.

13. The semiconductor device as claimed in

claim 11, wherein a substrate is beneath the first resistance layer.

14. A semiconductor device, comprising:

a gate electrode;

an insulating layer on the gate electrode;

a first resistance layer on the insulating layer;

an organic semiconductor layer on the first resistance layer;

a first electrode on the organic semiconductor layer; and

a second electrode on the organic semiconductor layer at an interval with the first electrode,

wherein the first resistance layer has an electrical resistance lower than an electrical resistance of the organic semiconductor layer.

15. The semiconductor device as claimed in claim 14, wherein two opposite ends of the first resistance layer are covered by the organic semiconductor layer.

16. The semiconductor device as claimed in claim 14, further comprising a second resistance layer formed at least at one of the position between the first resistance layer and the organic semiconductor layer, the position between the first electrode and the organic semiconductor layer, and the position between the second electrode and the organic semiconductor layer,

wherein the second resistance layer has an electrical resistance so that carriers in the organic semiconductor layer are allowed to tunnel through the second resistance layer when a voltage of a predetermined value or more than the predetermined value is applied across the second resistance layer.

17. The semiconductor device as claimed in claim 14, wherein a substrate is beneath the gate electrode.

18. The semiconductor device as claimed in claim 1, wherein the organic semiconductor layer is formed from

at least one organic material selected from the group consisting of poly(N-vinylcarbazole) derivatives, poly(γ-(carbazolylethyl)glutamate) derivatives, poly(vinylphenanthrene) derivatives, polysilane derivatives, oxazole derivatives, oxadiazole derivatives, imidazole derivatives, arylamine derivatives such as monoarylamine derivatives and triarylamine derivatives, benzidine derivatives, diarylmethane derivatives, triarylmethane derivatives, styrylanthracene derivatives, pyrazoline derivatives, divinylbenzene derivatives, hydrazone derivatives, indene derivatives, indenone derivatives, butadiene derivatives, pyrene derivatives such as pyrene-folmaldehyde and poly(vinylpyrene), stilbene

derivatives such as α-phenylstilbene derivatives, and bis-stilbene derivatives, enamine derivatives, fluorenone and derivatives thereof, poly(fluorenone) and derivatives thereof, and thiophene derivatives such as poly(alkylthiophene), or

at least one organic material selected from the group consisting of pentacene, tetracene, bis-azo pigments, tris-azo pigments, poly-azo pigments, triarylmethane-based pigments, thiazine-based pigments, oxazine-based pigments, xanthene-based pigments, cyanine pigments, styryl pigments, pyrylium-based pigments, quinacridone-based pigments, indigo-based pigments, perylene-based pigments, polycyclic quinone-based pigments, bis(benzimidazole)-based pigments, indanthrone-based pigments, squarylium-based pigments, anthraquinone-based pigments, and phthalocyanine-based pigments such as copper phthalocyanine and titanylphthalocyanine.

19. The semiconductor device as claimed in claim 1, wherein the first resistance layer is formed from at least one electrically conductive material of

polyacetylene-based electrically conductive polymers, polyphenylene-based electrically conductive polymers such as poly(para-phenylene) and derivatives thereof and poly(phenylene vinylene) and derivatives thereof, heterocyclic electrically conductive polymers such as polypyrrole and derivatives thereof, polythiophene and derivatives thereof, poly(ethylenedioxythiophene) and derivatives thereof, and polyfuran and derivatives thereof, ionic electrically conductive polymers such as polyaniline and derivatives thereof, and metals of chromium (Cr), tantalum (Ta), titanium (Ti), copper (Cu), aluminum (Al), molybdenum (Mo), tungsten (W), nickel (Ni), gold (Au), palladium (Pd), platinum (Pt), silver (Ag), and tin (Sn).

20. The semiconductor device as claimed in claim 1, wherein the first resistance layer comprises at least one dopant with a low vapor pressure including one or more of poly(sulfonic acid), poly(styrenesulfonic acid), naphthalenesulfonic acid, and alkylnaphthalenesulfonic acid.

21. The semiconductor device as claimed in claim 1, wherein each of the first electrode, the second electrode, and the gate electrode is formed from

at least one of chromium (Cr), tantalum (Ta), titanium (Ti), copper (Cu), aluminum (Al), molybdenum (Mo), tungsten (W), nickel (Ni), gold (Au), palladium (Pd), platinum (Pt), silver (Ag), and tin (Sn), or

at least one electrically conductive polymer of polyacetylene-based electrically conductive polymers, polyphenylene-based electrically conductive polymers such as poly(para-phenylene) and derivatives thereof and poly(phenylene vinylene) and derivatives thereof, heterocyclic electrically conductive polymers such as polypyrrole and derivatives thereof, polythiophene and derivatives thereof, poly(ethylenedioxythiophene) and derivatives thereof, and polyfuran and derivatives thereof, and ionic electrically conductive polymers such as polyaniline and derivatives thereof.

22. The semiconductor device as claimed in claim 1, wherein the insulating layer is formed from

at least one resin selected from the group consisting of thermoplastic resins such as styrene-based polymers such as copoly(styrene/butadiene), copoly(styrene/acrylonitrile), terpoly(styrene/acrylonitrile/butadiene), copoly(styrene/maleic acid), and copoly(styrene/acrylic acid), polyethylene-based resins such as copoly(ethylene/vinyl acetate), and chlorinated polyethylenes, polypropylene, vinyl chloride-based resins such as copoly(vinyl chloride/vinyl acetate), polyester alkyd resins, polyamides, polyurethanes, polycarbonates, polyallylates, polysulfones, diallyl phthalate resin, poly(vinylbutyral) resin, polyether resins, polyester resins, acrylic resin, silicone resin, epoxy resins, phenolic resin, urea resin, melamine resin, fluorocarbon resins such as PFA, PTFE, and PVDF, Parylene resin, polyimide resins, and photo-setting resins such as epoxyacrylates and urethane acrylates, or

a metal oxide produced via oxidation of a surface of an electrode layer formed from the metal.

23. The semiconductor device as claimed in claim 1, wherein the insulating layer is formed from at least a metal oxide film produced by coating and baking a solution obtained via hydrolysis of a metal alkoxide represented by one of the general formulas $M(OR)_n$ and $MR(OR')_{n-1}$, wherein each of R and R' is an organic group such as an alkyl group and a phenyl group, M is a metal in one of IVA through VIIA groups, VIII group, and IB through VIB groups of the periodic table, and n is an ionic valence of the metal M.

24. The semiconductor device as claimed in claim 4, wherein the second resistance layer is formed from at least one resin selected from the group consisting of thermoplastic resins such as styrene-based polymers such as copoly(styrene/butadiene), copoly(styrene/acrylonitrile), terpoly(styrene/acrylonitrile/butadiene), copoly(styrene/maleic acid), and copoly(styrene/acrylic acid), polyethylene-based resins such as

copoly(ethylene/vinyl acetate), and chlorinated polyethylenes, polypropylene, vinyl chloride-based resins such as copoly(vinyl chloride/vinyl acetate), polyester alkyd resins, polyamides, polyurethanes, polycarbonates, polyallylates, polysulfones, diallyl phthalate resin, poly(vinylbutyral) resin, polyether resins, polyester resins, acrylic resin, silicone resin, epoxy resins, phenolic resin, urea resin, melamine resin, fluorocarbon resins such as PFA, PTFE, and PVDF, Parylene resin, polyimide resins, and photo-setting resins such as epoxyacrylates and urethane acrylates, or

a metal oxide produced via oxidation of a surface of at least one of the first electrode and the second electrode.

25. The semiconductor device as claimed in claim 4, wherein the second resistance layer is formed from at least a metal oxide film produced by coating and baking a solution obtained via hydrolysis of a metal alkoxide represented by one of the general formulas $M(OR)_n$ and $MR(OR')_{n-1}$, wherein each of R and R'

is an organic group such as an alkyl group and a phenyl group, M is a metal in one of IVA through VIIA groups, VIII group, and IB through VIB groups of the periodic table, and n is an ionic valence of the metal M.

26. The semiconductor device as claimed in claim 1, further comprising:

a first power supply conducting a current between the first electrode and the second electrode; and

a second power supply applying a voltage to the gate electrode.

27. An electroluminescent display device, comprising a plurality of semiconductor devices, each semiconductor device including:

a gate electrode;

an insulating layer on the gate electrode;

a first electrode on the insulating layer;

a second electrode on the insulating layer at an interval with the first electrode;

an organic semiconductor layer disposed in the interval between the first electrode and the second electrode and covering at least part of the first electrode and the second electrode; and

a first resistance layer formed on the organic semiconductor layer and having an electrical resistance lower than an electrical resistance of the organic semiconductor layer.

28. An electroluminescent display device including a plurality of semiconductor devices and a plurality of light emitting elements arranged in a matrix manner on a substrate,

each of the semiconductor devices comprising:

a gate electrode on the substrate;

an insulating layer covering ends and a surface of the gate electrode;

a first electrode on the insulating layer;

a second electrode on the insulating layer

at an interval with the first electrode;

an organic semiconductor layer disposed in the interval between the first electrode and the second electrode and covering at least part of the first electrode and the second electrode; and

a first resistance layer formed on the organic semiconductor layer and having an electrical resistance lower than an electrical resistance of the organic semiconductor layer,

the light emitting element comprising:

a transparent electrode on the substrate;

an electroluminescent layer on the transparent electrode; and

a cathode on the electroluminescent layer,

wherein the first electrode is electrically connected with the transparent electrode.

29. A liquid crystal display device, comprising a semiconductor device including:

a gate electrode;

an insulating layer on the gate electrode;

a first electrode on the insulating layer;

a second electrode on the insulating layer at an interval with the first electrode;

an organic semiconductor layer disposed in the interval between the first electrode and the second electrode and covering at least part of the first electrode and the second electrode; and

a first resistance layer formed on the organic semiconductor layer and having an electrical resistance lower than an electrical resistance of the organic semiconductor layer.

30. A calculating device, comprising at least one of a NOT circuit, a NAND circuit, and a NOR circuit each including a plurality of semiconductor devices,

each of the semiconductor devices including:

a gate electrode;

an insulating layer on the gate electrode;

a first electrode on the insulating layer;

a second electrode on the insulating layer at an interval with the first electrode;

an organic semiconductor layer disposed in

the interval between the first electrode and the second electrode and covering at least part of the first electrode and the second electrode; and

a first resistance layer formed on the organic semiconductor layer and having an electrical resistance lower than an electrical resistance of the organic semiconductor layer.

31. The semiconductor device as claimed in claim 1, wherein the organic semiconductor layer includes a dielectric material.

32. The semiconductor device as claimed in claim 31, wherein the dielectric material is selected from

styrene-based polymers such as copoly(styrene/butadiene), copoly(styrene/acrylonitrile), terpoly(styrene/acrylonitrile/butadiene),

copoly(styrene/maleic acid), and copoly(styrene/acrylic acid), polyethylene-based resins such as copoly(ethylene/vinyl acetate), and chlorinated polyethylenes, polypropylene, vinyl chloride-based resins such as copoly(vinyl chloride/vinyl acetate), polyester alkyd resins, polyamides, polyurethanes, polycarbonates, polyallylates, polysulfones, diallyl phthalate resin, poly(vinylbutyral) resin, polyether resins, polyester resins, acrylic resin, silicone resin, epoxy resins, phenolic resin, urea resin, melamine resin, fluorocarbon resins such as PFA, PTFE, and PVDF, Parylene resin, polyimide resins, and photo-setting resins such as epoxyacrylates and urethane acrylates,

a metal oxide film produced by baking a solution obtained via hydrolysis of a metal alkoxide represented by one of the general formulas $M(OR)_n$ and $MR(OR')_{n-1}$, in which each of R and R′ is an organic group such as an alkyl group and a phenyl group, M is a metal in one of IVA through VIIA groups, VIII group, and IB through VIB groups of the periodic table, and n is an ionic valence of the metal M,

an oxide of one of Al, Ta, and W, Si, and

a nitride of Si.